# PA31A-0815 Producing Science to Inform Policy on Hemispheric Transport of Air Pollution

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## The Task Force on Hemispheric Transport of Air Pollution

Task Force on Hemispheric Transport of Air Pollution

**Chairs: Terry Keating (United States) and André Zuber (European Community)**

**Mission:** To develop a fuller understanding of the hemispheric transport of air pollution to inform future negotiations under the Convention on Long Range Transboundary Air Pollution (CLRTAP).

**Background:** Evidence from both observational and modeling studies indicates that pollutant emissions from one continent (source) influence air quality over other continents (receptors). A lack of community-wide consistency in defining source-receptor regions and in reporting air quality metrics, however, hinders assessment of the policy implications of intercontinental transport.

**Products:** **2007 Interim Report** to inform the review of the CLRTAP Gothenburg Protocol to abate acidification, eutrophication, and tropospheric ozone.
**2009 Assessment Report** to inform the CLRTAP about hemispheric air pollution and source-receptor relationships for ozone, aerosols, mercury, and POPs.

**Challenge:** Balancing the limited time and resources of individual research groups available for a community-wide effort with the needs of the policy community.

**Opportunity:** Framework to move information from the science to the policy community fosters a rapid exchange of ideas, helping to identify research priorities and gain insights through collaboration.

**Approach:**
1. Define a set of focused, policy-relevant questions.
2. Engage the scientific community in designing a set of experiments to address these questions.
3. Translate science results into metrics that are directly relevant to air quality policy goals.
4. Maintain an open dialogue among participants via several communication avenues.

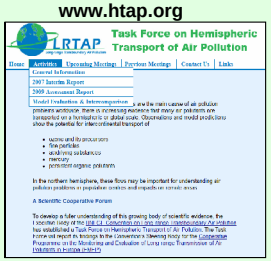
### A Multi-model Assessment

**Objectives:** Quantify source-receptor relationships for HTAP regions (see top right) and assess uncertainties in these estimates.

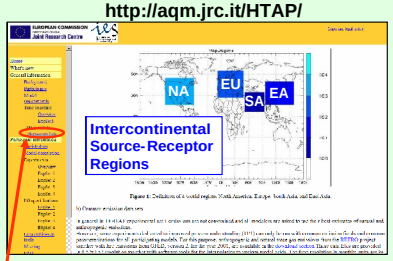
**Methods:**
1. Encourage participation of groups with global 3D tropospheric chemistry models (require horizontal resolution of 4°x5° or finer).
2. Specify base case simulation: 2001 meteorology; methane set to a uniform value of 1760 ppb; each group uses its best estimate for $NO_x$, NMVOC, CO emissions.
3. Conduct sensitivity simulations: 20% reductions of anthropogenic $NO_x$, NMVOC, and CO individually from each HTAP region, and a 20% reduction of $CH_4$ abundances to 1408 ppb (13 total simulations).
4. Require model output to comply with CF conventions (a version of the Climate Model Output Rewriter is available for this task).

## Encouraging Dialogue: TF HTAP Communication Avenues

**www.htap.org**




**http://aqm.jrc.it/HTAP/**




**To join the TF HTAP listserv, click here**
**or send a blank email to subscribe-tfhtap@lists.epa.gov**

### Meetings and Workshops

| Date | Title | Purpose | Location |
|---|---|---|---|
| JUN 1-3, 2005 | First TF Meeting | Develop a work plan | Brussels, Belgium |
| JAN 30-31, 2006 | Modeling Workshop | Organize multi-model assessment of HTAP and draft outline of 2007 interim report | Washington, D.C., U.S.A. |
| JUN 6-8, 2006 | Second TF Meeting | Review science of mercury, POPs, and methane as an ozone precursor; agree on 2007 work plan | Moscow, Russia |
| OCT 18-20, 2006 | Emissions Inventory and Future Projections Workshop | Evaluate current emission inventories and future projections | Beijing, China |
| JAN 24-26, 2007 | Integrated Observations Workshop | Assess state of current observational networks; discuss how to fill gaps and produce common data bases | Geneva, Switzerland |
| JAN 27, 2007 | Model Inter-comparison Meeting | Discuss initial analyses and priorities for 2007 interim report | Geneva, Switzerland |
| MAY 30 – JUN 1, 2007 | Third TF Meeting | Accept the 2007 interim report; agree on 2008 workplan | London, U.K. |

## Assessment of Hemispheric Ozone Transport: Example Analysis of Results From One Model

### Response of seasonal mean surface $O_3$ over the HTAP receptor regions to 20% reductions in:

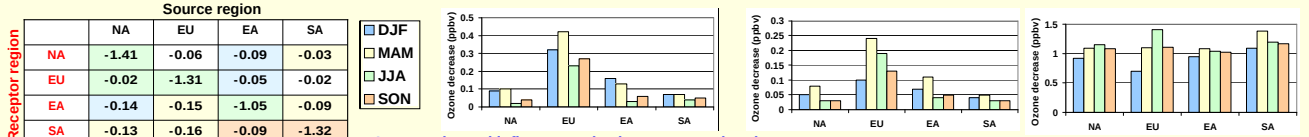
**Anthropogenic $NO_x$**

Source region

| Receptor region | NA | EU | EA | SA |
|---|---|---|---|---|
| NA | -1.41 | -0.06 | -0.09 | -0.03 |
| EU | -0.02 | -1.31 | -0.05 | -0.02 |
| EA | -0.14 | -0.15 | -1.05 | -0.09 |
| SA | -0.13 | -0.16 | -0.09 | -1.32 |

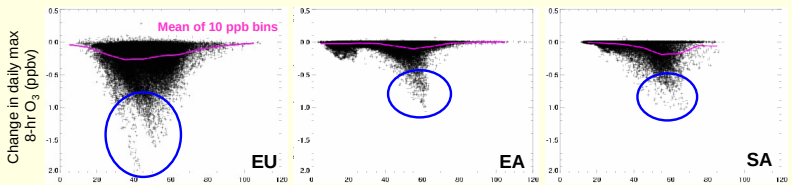
The table shows the change in seasonal mean $O_3$ (ppbv) resulting from a 20% reduction of anthropogenic $NO_x$ emissions in the source regions for the season of maximum impact. Table cells with equivalent impacts in multiple seasons are colored white.

**EU Anthropogenic NMVOC** | **EU Anthropogenic CO** | **Methane**




- **Intercontinental influence varies by season and region**
- **Maximum intercontinental influence does not always occur in season with highest base case seasonal mean $O_3$ in the receptor region (highest base case $O_3$ occurs in summer for EU; spring for EA and NA; winter for SA)**
- **In spring, European $NO_x$, CO, and NMVOC contribute similarly to $O_3$ over NA and EA; $NO_x$ reductions are more effective over SA**
- **A 20% decrease in $CH_4$ lowers surface $O_3$ by ~1 ppbv in all HTAP regions, with EU subject to the largest seasonal variation**

### Intercontinental impacts of a 20% decrease in North American anthropogenic $NO_x$ in summer




Base case daily max 8-hr average $O_3$ (ppbv)

**Each point represents one daily maximum 8-hour average $O_3$ value in one model grid cell from June 1 to August 31**

**Intercontinental influence is typically largest near the middle of the overall $O_3$ distribution and smaller under the cleanest and most polluted conditions**

## Next steps

- **Distribute a visualization tool for modeling participants to examine and error-check results**
- **Analyze results from all participating models, plus new simulations (to be submitted by January 15, 2007) with NMVOC, CO, and all $O_3$ precursors simultaneously reduced from all HTAP regions**
- **Use cross-model range as an estimate of uncertainty**
- **Increase focus on metrics directly relevant to policy (e.g. 8-hr daily maximum $O_3$)**
- **Incorporate results into 2007 Interim Report**

**All results shown here are from the GFDL MOZART-2 model**

## Organizations Contributing to The HTAP Modeling Effort

**AMDAL/CRESS York University**
**ICG-II, Forschungszentrum Jülich**
**Laboratoire de Météorologie Dynamique**
**Service d'Aéronomie, CNRS**
**University of Maryland Baltimore County**
**CIEMAT**
**CNR-IIA**
**ECPL-UOC**
**EMEP/MSC-E**
**EMEP/MSC-W**
**Environment Canada**
**NOAA/GFDL**
**Harvard University**
**IIA-CNR**
**Italian Research Council**
**JRC-IES**
**Lamar University**
**LLNL**
**LSCE-CEA**
**NASA GISS**
**NASA GSFC**
**NCAR**
**NERI**
**UK Met Office**
**University of Cambridge**
**University of Edinburgh**
**University of Oslo**

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